



RESEARCH

Cariboo Forest Region

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EXTENSION
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Harvesting and Streamflow

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"Does harvesting change streamflow patterns in logged watersheds?" This Extension Note will help to clarify some of the factors in predicting changes in streamflow after harvesting.

INTRODUCTION

The effects of logging activities on streamflow have been studied by hydrologists for decades. Some of the streamflow characteristics of particular interest have been **annual water yield, peak flow, and low flow**. These are important because they affect the availability of water for human use and the suitability of aquatic habitat for fish. The streamflow characteristics that are most important at a particular place and time depend on seasonal runoff patterns and the changing seasonal water needs of people and fish.

In the B.C. Interior, streamflow is normally high in the spring due to snowmelt. After the snowmelt freshet, streamflow tends to decrease through the summer, fall and winter. Unlike coastal conditions, the Interior does not normally have rain-related floods in the autumn and winter. The hotter,

drier summers of the Interior cause consistently lower August and September streamflows.

Unusually high or low flows can be detrimental to water use for both humans and fish. Above-average high flows are significant because most sediment transport and channel change occur during relatively short periods with the highest discharge. High flows and channel changes can damage aquatic habitat, bridges and roads.

Summer low flows that are below average are detrimental for human water use because domestic and agricultural water demands are also high at this time. These conditions can also be harmful to fish by decreasing the size of their habitat, increasing water temperatures, and reducing oxygen concentrations.

DISCUSSION

The most commonly observed effect that timber harvesting has on streamflow is to increase annual water yield. One reason for this is a reduction in the uptake and transpiration of water from the soil

RESEARCH Section, Ministry of Forests, Cariboo Forest Region

200 - 640 Borland Street, Williams Lake, BC V2G 4T1 Phone (250)398-4345

Fax (250)398-4380 <http://www.for.gov.bc.ca/cariboo/research/research.htm>

after tree removal. The top few centimetres of soil may actually be drier after harvesting due to the increased exposure to sun and wind, but total soil moisture in the top metre generally increases. More water left in the soil in clearings allows more groundwater recharge, more discharge from springs, and higher streamflow.

Increases in soil moisture and streamflow due to this effect are most prominent late in the growing season when a forest has had time to lower soil moisture to a seasonal minimum. Therefore, harvest-related increases in streamflow during the late summer low flow period are common.

Another reason for increased water yield is the effect of timber harvesting

on snow. Trees intercept snow and allow for melt, evaporation and sublimation in the canopy. Clearcuts consequently tend to get more snow than forested sites. Furthermore, snow melts faster in clearcuts than in the forest, resulting in higher and faster runoff from clearcuts. The effect of this on peak flows in a given watershed, however, depends on the location of the areas contributing to snowmelt at the time of the peak. Data from Swanson and Hillman (1977) illustrate both increased peak flows and water yield after harvesting.

Researchers have found that streamflow changes are generally hard to detect in watersheds where less than 30% of the area has been cleared. However, other kinds of stream disturbance can occur

with much less area disturbance. For example, roads can cause harmful levels of sedimentation even without any harvesting.

CONTACT

For more information, contact **Patrick Teti**, Research Hydrologist, at 398-4752.

REFERENCE

Swanson, R.H. and G.R. Hillman. 1977. Predicted increased water yield after clearcutting verified in west-central Alberta. Fish. Env. Can., Can. For. Ser., North. For. Res. Cent. Inf. Rep. NOR-X-198.

Figure 1 shows average hydrographs for nine unlogged watersheds and nine watersheds with 50% of the area harvested in the Alberta Rockies. During the May snowmelt freshet there was an average of 42% more runoff and 61% higher peak flows from the logged than the unlogged watersheds.



